James Acker:
Hi Eurico - we'll give everyone about two more minutes to get back from the lunch hour (or dinner, depending on where they are)

Eurico D'Sa:
Ok, thanks

James Acker:
Our next presenter is Eurico D'Sa, a long time friend of ocean color data from the GES DISC. Our next presentations will follow an ocean theme, leading off with Eurico's presentation on the northern Gulf of Mexico coast.

Eurico, you have the ball.

Eurico D'Sa:
Thanks, Jim

Slide 1: My talk will focus on the use of ocean color SeaWiFS data in conjunction with the QuikSCAT wind data to study the chlorophyll distribution and variability in the northern Gulf of Mexico waters influenced by the Mississippi and Atchafalaya Rivers.

I would like to acknowledge partial support for this work from NASA – Applied Sciences Program and the Bureau of Ocean Energy and Management (BOEM)

Slide 2: Three main objectives of this study were to examine
i) Chlorophyll a (Chl) distribution in relation to wind forcing
ii) Chl variability under different river discharge regimes
and iii) analysis of long-time series SeaWiFS Chl data to examine dominant scales of Chl variability in a near field zone directly influenced by the river and a far field zone

Slide 3: The Mississippi River which drains 41% of the continental US, discharges large quantities of freshwater into the northern Gulf of Mexico. As a result, both the rivers deliver large fluxes of nutrients that sustain elevated primary production and chlorophyll biomass in the plume and shelf waters.

Slide 4: Upper circulation in the northern Gulf of Mexico is strongly influenced by winds and Loop Current generated eddies.

During fall, winter and spring, wind stress generated currents generally flow westward along the Louisiana coast. During summer, winds and along-shore sea surface slope currents influence the reversal and upcoast flow of coastal currents.

Slide 5: Satellite wind data used in this study were derived from the SeaWinds instrument onboard the QuikSCAT satellite. Data were downloaded from JPL NASA website and converted to wind stress using the drag coefficient from Large and Pond 1981.

Slide 6: An example of monthly mean QuikSCAT derived wind stress vectors (N/m2) superimposed on SeaWiFS chlorophyll imagery. Time series Chl data were obtained from Giovanni online system for locations A, B, C, and D for used in this study

Slide 7: Northern Gulf of Mexico is frequently impacted by cold fronts during winter and spring. Left panel shows patterns of QuikSCAT winds during a cold front passage in March 2002. Southeasterly winds were prevalent (18 March) before the frontal passage (top left image). Frontal passage was accompanied by strong northerly winds (bottom left image).

SeaWiFS Chl images (right panel) obtained before and after the frontal passage showing the strong response of surface waters and phytoplankton biomass to wind forcing

Slide 8: Discharge from the Mississippi and Atchafalaya Rivers for the period Jan 2000 to Dec 2001. Although trends were similar, peaks in river discharge from the Mississippi River (MR) are about 2.5 times larger than the Atchafalaya River (AR); Peak in river discharge occurred in April (19,368 and 8,240 m3/s, respectively for the MR and AR)

Slide 9: This is a rather busy slide showing images of monthly wind stress superimposed on SeaWiFS Chl for a low river discharge year (2000). A close examination of this slide indicates that in addition to seasonal river discharge, wind forcing plays an important role in influencing chlorophyll distribution around the delta and shelf waters of the study area

Slide 10: Another busy slide showing imagery of monthly wind stress superimposed on SeaWiFS Chl maps for a normal river discharge year (2001). Overall Chl levels were higher around the deltas and the shelf waters.

As in the year 2000, wind reversals during the summer resulted in elevated levels of Chl being transported into the oligotrophic waters of the Gulf. Net offshore wind stress during winter appears to transport phytoplankton biomass laden waters offshore.

Slide 11: Lower left figure shows the weekly time series SeaWiFS Chl at location A just west of the Mississippi delta. Overall Chl levels were higher in 2001 in comparison to the year 2000. Peaks in Chl appeared to lag peaks in river discharge. Compares well with earlier satellite studies (Walker and Rabalais 2006)

Slide 12: This slide shows the time series Chl at the offshore locations C and D. Chl values were in general higher in 2001 than in 2000 (lower left panel). During March 2000 (right panel – top image) Chl concentrations at the two offshore locations C and D were similar at ~0.2 mg/m3.

In Dec 2000 when river flow was just picking up from its lowest level, Chl was highest at locations C and D (~0.6 mg/m3) likely associated with the offshore transport of waters due to strong southerly wind stress (lower right panel)

Slide 13: In this slide we show typical wind stress patterns during spring (April) and summer months (June and July of 2001) and their effects on the Chl distribution

Slide 14: Here, patterns of wind stress and Chl distribution during fall (Nov) and winter (Dec) of 2001 are shown in the two images.

Slide 15: SeaWiFS Chl composited to 15-day means was used to generate time series data over a 10-year period between 1998-2007. Study area divided into zones and time series Chl anomalies were determined

along a 20 m isobath just west of the Mississippi river and along100 m isobath off the Texas coast (far field, not directly under river influence)

Wavelet transform was applied to mean Chlorophyll anomaly data.

Slide 16: The output of the wavelet transform is a local wavelet power spectrum that depicts the variance in Chl ((mg/m3) squared). As the time series has finite length, errors increase at the edges of the wavelet spectrum and should be interpreted with caution.

(bottom figure) The normalized scale-averaged time series denotes the mean variance in the 30-100 day period band with the green line denoting the 95% confidence level

Slide 17: In a zone west of the Atchafalaya River, significant peaks in Chl variance occurred in June 2002 and September 2005

Slide 18: Maxima in Chl variance in June/July 2002 off the Texas coast. Overall, over a 10-year period no increasing trend of Chl variance observed at this location

Slide 19: Significant peak in Chl variance in September 2005 associated with passage and landfall of Hurricane Rita off the Texas coast.

Hurricane Katrina which made landfall on 29 Aug 2005 may have contributed to increased phytoplankton
biomass off the Louisiana coast.

Slide 20: In summary……

James Acker:
Thank you, Eurico. May I make a comment?

Eurico D'Sa:
sure

James Acker:
Thanks. Last week I met with reps from the NASA DAAC User Services Working Group.

The JPL PODAAC rep showed their "State of the Ocean" tool, also a nice application.

I saw that Hurricane Isaac's rain had produced a plume of chlorophyll/organic matter that became entrained in the Loop Current and was pulled nearly to the Yucatan Peninsula.

Should be clear in the Giovanni 8-day data.

So my question: do you know how close the Loop Current can get to the northern Gulf shelf?

Eurico D'Sa:
Yes, Isaac will also have significant effects along the Louisiana coast

It can get up to the shelf edge. Can get quite close to the bird-foot delta

James Acker:
That's what appears to have happened. I hope to make a Giovanni user image for it.

Thanks again. So it's now my turn - Atheer can make me the presenter.

Eurico D'Sa:
Thanks everyone!